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Indian Standard
SPECIFICATION FOR MAGNESIUM SULPHATE (EPSOM SALTS)
(*First Revision*)

Second Reprint JANUARY 1996

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NEW DELHI 110002

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December 1977

AMENDMENT NO. 1 JANUARY 1998
TO
IS 2730 : 1977 SPECIFICATION FOR MAGNESIUM SULPHATE (EPSOM SALTS)
(First Revision)

(*Page* 6, *clause* **A-2.1.3**, *line* 1) — Substitute '0.500 5 g' *for* '5.005 g'.

(*Page* 6, *clause* **A-2.2.1**, *line* 2) — Substitute 'calcium' *for* 'magnesium'.

(CHD 3)

Reprography Unit, BIS, New Delhi, India

Indian Standard
SPECIFICATION FOR MAGNESIUM SULPHATE (EPSOM SALTS)
(First Revision)

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Indian Standard

SPECIFICATION FOR MAGNESIUM SULPHATE (EPSOM SALTS)

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 27 July 1977, after the draft finalized by the Inorganic Chemicals (Miscellaneous) Sectional Committee had been approved by the Chemical Division Council.

0.2 Two Indian Standard specifications had originally been published for magnesium sulphate, IS : 257-1950 for the technical grade of the material, and IS : 377-1954 for the pharmaceutical grade. These two specifications were later on amalgamated as IS : 2730-1964. The first revision had been taken up in the light of experience gained by the manufacturers and consumers in the country. Changes have been made in the limit of magnesium sulphate content and the limits of chlorides and iron for technical grade of the material for use in leather industry. The requirements of a pharmaceutical grade have been deleted from this revision.

0.3 This standard contains clause **3.1.1** which calls for agreement between the purchaser and the supplier.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for magnesium sulphate (epsom salts).

---

*Rules for rounding off numerical values (*revised*).

2. GRADES

2.1 The material shall be of the following two grades:

a) Pure, and

b) Technical.

2.1.1 Pure grade of the material is used in cosmetics, mineral waters, explosives and weighting of silk. The technical grade of the material is used in textile and leather industries where it is used as a tan precipitant for the purpose of fixing tan. It is also used as a micronutrient in fertilizers to meet magnesium deficiency in plants.

3. REQUIREMENTS

3.1 Description — The material shall be in the form of colourless crystals, soluble in water and sparingly soluble in ethyl alcohol (90 percent *v/v)* .

3.1.1 The crystals are liable to become powdery on efflorescence and, unless otherwise agreed to between the purchaser and the supplier, such a condition shall not render the material unacceptable.

3.2 The material shall also comply with the requirements given in Table 1 when tested according to the methods prescribed in Appendix A. Reference to the relevant clauses of the appendix is given in col 5 of the table.

4. PACKING AND MARKING

4.1 Packing — The material shall be packed in air-tight containers as agreed to between the purchaser and the supplier. The containers used for packing the pure grade shall be polyethylene lined.

4.2 Marking — Each container shall be marked with the following information:

a) Name and grade of the material;

b) A statement if the material is intended for use in leather industry;

c) Net mass of the material;

d) Month and year of packing;

e) Manufacturer's name and/or his recognized trade-mark, if any; and

f) Lot number to enable the date of manufacture to be traced from records.

TABLE 1 REQUIREMENTS FOR MAGNESIUM SULPHATE (EPSOM SALTS)

(*Clause* 3.2)

SL NO.	CHARACTERISTIC	REQUIREMENT FOR GRADE		METHOD OF TEST (REF TO CL NO. IN APPENDIX A)
		Pure	Technical	
(1)	(2)	(3)	(4)	(5)
i)	Magnesium sulphate (as $MgSO_4$), (calculated with reference to the material dried at 300°C), percent by mass	99.5 to 100.5	98.0 to 100.5	A-2
ii)	Chlorides (as Cl), percent by mass, *Max*	0.12	1.0*	A-3
iii)	Lead (as Pb), parts per million, *Max*	5	—	A-4
iv)	Arsenic (as As_2O_3), parts per million, *Max*	2	—	A-5
v)	Iron as (Fe), percent by mass, *Max*	0.002 (20 ppm)	0.007* (70 ppm)	A-6
vi)	Zinc	To pass the test	—	A-7
vii)	Matter insoluble in water, percent by mass, *Max*	—	0.20	A-8
viii)	Acidity or alkalinity	To pass the test	—	A-9

*For technical grade of the material when required for leather industry, the limit for chloride (as Cl) shall be 0.6 percent by mass. *Max,* and the limit for iron (as Fe) shall be 0.001 percent by mass, *Max*.

4.2.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING

5.1 The method of drawing representative samples of the material, number of tests to be performed and the criteria for conformity of the material to the requirements of this specification shall be as prescribed in Appendix B.

APPENDIX A

(*Clause* 3.2)

METHODS OF TEST FOR MAGNESIUM SULPHATE (EPSOM SALTS)

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977*) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. DETERMINATION OF MAGNESIUM SULPHATE

A-2.1 Reagents

A-2.1.1 *Patton and Reeders' Indicator* — Mix 0.1 g of 2-hydroxy 1-(2-hydroxy-4-sulpho-l-naphthylazo)-3-naphthoic acid with 10 g of sodium sulphate powder.

A-2.1.2 *Ammonium Hydroxide-Ammonium Chloride Buffer Solution* — Mix 350 ml of ammonium hydroxide (20 percent *m/m*) with 54 g of ammonium chloride. Dilute with water and make up the volume to 1 000 ml. (The *p*H of the solution should be not more than 10.)

A-2.1.3 *Standard Calcium Solution* — 0.01 M. Dissolve 5.005 g of calcium carbonate ($CaCO_3$) in dilute hydrochloric acid; when effervescence ceases, dilute with water to 500 ml.

A-2.1.4 *Ethylenediamine Tetra-Acetate (EOTA) Solution* — 0.01 M. Dissolve 3.72 g of disodium ethylenediamine tetra-acetate dihydrate in water and make up the volume to one litre.

A-2.2 Procedure

A-2.2.1 *Standardization of EDTA Solution* — Take 10 ml of standard magnesium solution in a conical flask. Add 20 ml of water, one millilitre of Patton and Reeders' indicator and 25 ml of ammonium hydroxide-ammonium chloride buffer solution. Heat to 40 to 50°C and then titrate with EDTA solution, maintaining the temperature between 40 and 50°C until the colour changes from wine red to distinct blue.

---

*Specification for water for general laboratory use (*second revision*).

A-2.2.1.1 Molarity of EDTA solution $= \dfrac{10\ M_1}{V_1}$

where

M_1 = molarity of standard calcium solution, and
V_1 = volume in ml of EDTA solution used for titration.

A-2.2.2 Weigh accurately about 1 g of the material, previously dried at 300°C and dissolve in 100 ml of water in a volumetric flask. Take 10 ml of this solution in a conical flask. Add 20 ml of water, about 0.5 g of Patton and Reeders' indicator and 25 ml of ammonium hydroxide-ammonium chloride buffer solution. Heat to 40 to 50°C and titrate with standard EDTA solution, maintaining the temperature between 40 and 50°C, until the colour changes from wine red to distinct blue.

A-2.3 Calculation

$$\text{Magnesium sulphate (MgSO}_4\text{), percent by mass} = \frac{120{\cdot}4\ V_2\ M_2}{M}$$

where

V_2 = volume in ml of standard EDTA solution used in **A-2.2.2.**
M_2 = molarity of standard EDTA solution as determined in **A-2.2.1,** and
M = mass in g of the material taken for the test.

A-3. TEST FOR CHLORIDES

A-3.1 Apparatus

A-3.1.1 *Nessler Cylinders* — 50 ml capacity.

A-3.2 Reagents

A-3.2.1 *Dilute Nitric Acid* — approximately 5 N.

A-3.2.2 *Silver Nitrate Solution* — approximately 5 percent.

A-3.2.3 *Standard Sodium Chloride Solution* — 0.01 N.

A-3.3 Procedure

A-3.3.1 *For Pure Grade* — Dissolve 0.30 g of the material in 10 ml of water. Add 10 ml of dilute nitric acid and one millilitre of silver nitrate solution. Transfer the solution completely into a Nessler cylinder. Dilute the solution with water to 50 ml. Carry out a control test in another Nessler cylinder using one millilitre of standard sodium chloride solution in place of the material and the same quantities of other reagents in the same total volume of the reaction mixture. Stir both the solutions with a glass rod and compare the turbidities after five minutes.

A-3.3.2 *For Technical Grade* — In the case of technical grade, use 0.035 g of the material and follow the same procedure as given in **A-3.3.1**. For the material for use in leather industry, 0.06 g of the material shall be taken.

A-3.4 The limit prescribed in Table 1 shall be taken as not having been exceeded if the opalescence produced in the test with the material is not greater than that produced in the control test.

A-4. TEST FOR LEAD

A-4.1 Apparatus

A-4.1.1 *Nessler Cylinders* — 50 ml capacity.

A-4.2 Reagents

A-4.2.1 *Acetic Acid* — approximately 35 percent (*v/v*).

A-4.2.2 *Dilute Ammonium Hydroxide* — approximately 10 percent.

A-4.2.3 *Potassium Cyanide Solution* — Dissolve 10 g of potassium cyanide in 90 ml of water, add 2 ml of hydrogen peroxide [approximately 6 percent (*v/v*)], allow to stand for 24 hours and make up to 100 ml with water.

A-4.2.4 *Standard Lead Solution* — Dissolve 0.160 g of lead nitrate in water, add 1 ml of concentrated nitric acid and make up the solution to 1 000 ml. Pipette out 10 ml of the solution and dilute again to 100 ml with water. One millilitre of this solution contains 0.01 mg of lead (as Pb).

A-4.2.5 *Sodium Sulphide Solution* — approximately 10 percent.

A-4.3 Procedure — Weigh 12.0 g of the material into a Nessler cylinder and dissolve in 30 ml of hot water. Add 5 ml of acetic acid. Make it alkaline to litmus by gradual addition of dilute ammonium hydroxide and add 1 ml of potassium cyanide solution. Carry out a control test in the other Nessler cylinder using 2.0 g of the material, 5 ml of standard lead solution and the same quantities of other reagents. Filter both the solutions if they are turbid and, if the colours of the solutions differ, equalize by the addition of a few drops or a highly diluted solution of burnt sugar or other non-reactive substance. Dilute both the solutions with water and make up the volume to 50 ml. Add 2 drops of sodium sulphide solution to each cylinder, mix thoroughly and compare the colours developed in the two cylinders.

A-4.3.1 The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of colour produced in the test with the material is not greater than that produced in the control test.

A-5. TEST FOR ARSENIC

A-5.1 Preparation of Solution — Dissolve 1.00 g of the material in 10 ml of water.

A-5.2 Procedure — Carry out the test for arsenic with the solution prepared in **A-5.1,** as prescribed in **5.1** of IS: 2088-1971*, using for comparison a stain obtained with 0.002 mg of arsenic trioxide (as As_2O_3).

A-6. TEST FOR IRON

A-6.1 Apparatus

A-6.1.1 *Nessler Cylinders* — 100 ml capacity.

A-6.2 Reagents

A-6.2.1 *Citric Acid Solution* — 20 percent *(m/v).*

A-6.2.2 *Thioglycollic Acid*

A-6.2.3 *Ammonium Hydroxide* — 20 percent (*m/m*).

A-6.2.4 *Standard Iron Solution* — Dissolve 0.702 g of ferrous ammonium sulphate in water and add 10 ml of dilute sulphuric acid (10 percent *m/m*). Dilute the solution to one litre. One millilitre of the solution contains 0.1 mg of iron (as Fe).

A-6.3 Procedure — Dissolve 10.0 g of the material, accurately weighed, in 50 ml of water and transfer quantitatively to a Nessler cylinder. Add 10 ml of citric acid solution and five drops of thioglycollic acid, mix and make alkaline with ammonium hydroxide. Dilute with water to 100-ml mark and allow to stand for 5 minutes. Carry out a control test using the following quantities of standard iron solution in place of the material and the same quantities of other reagents in the same total volume of the reaction mixture:

a) 2 ml in case of pure grade;

b) 7 ml in case of technical grade; and

c) 1 ml in case when technical grade is required for leather industry.

A-6.3.1 Compare the colour produced in the two cylinders. The limits prescribed in Table 1 shall be taken as not having been exceeded if the colour produced in the test with the material is not darker than the colour produced in the control test.

---

*Methods of test for arsenic *(first revision)*.

A-7. TEST FOR ZINC

A-7.1 Reagents

A-7.1.1 *Dilute Acetic Acid* — approximately 53 percent (*v/v*).

A-7.1.2 *Potassium Ferrocyanide Solution* — approximately 5 percent.

A-7.2 Procedure — Dissolve 2.0 g of the material in 20 ml of water. Acidify the solution with dilute acetic acid and then add a few drops of potassium ferrocyanide solution.

A-7.2.1 The material shall be taken to have satisfied the requirement of the test if no turbidity is produced.

A-8. DETERMINATION OF MATTER INSOLUBLE IN WATER

A-8.1 Procedure — Accurately weigh about 10 g of the material. Dissolve it in 100 ml of water by stirring the solution well, warming, if necessary. Filter through a tared filter paper or a tared sintered glass crucible (G No. 4) or a Gooch crucible; wash thoroughly the residue till it is free from all soluble compounds and dry at 105 to 110°C to constant mass.

A-8.2 Calculation

$$\text{Matter insoluble in water, percent by mass} = \frac{100\,M_1}{M}$$

where

M_1 = mass in g of the residue, and

M = mass in g of the material taken for the test.

A-9. TEST FOR ACIDITY OR ALKALINITY

A-9.1 Reagents

A-9.1.1 *Phenol Red Indicator Solution* — Warm 50 mg of phenol red with 2.85 ml of N/20 sodium hydroxide and 5 ml of rectified spirit (*see* IS : 323-1959*) and dilute to 250 ml.

A-9.1.2 *Standard Hydrochloric Acid* — 0.01 N.

A-9.1.3 *Standard Sodium Hydroxide Solution* — 0.01 N.

A-9.2 Procedure — Weigh 1.0g of the material and dissolve in 10 ml of water. Add a few drops of phenol red indicator.

---

*Specification for rectified spirit (*revised*).

A-9.2.1 The material shall be taken to have passed the test if the solution does not require more than 0.2 ml of eiher 0.01 N hydrochloric acid or 0.01 N sodium hydroxide solution to change its colour.

APPENDIX B

(*Clause* 5.1)

SAMPLING OF MAGNESIUM SULPHATE (EPSOM SALTS)

B-1. GENERAL REQUIREMENTS OF SAMPLING

B-1.0 In drawing, preparing, storing and handling test samples, the following precautions and directions shall be observed.

B-1.1 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

B-1.2 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

B-1.3 The samples shall be placed in suitable, clean, dry and air-tight glass or other suitable containers on which the material has no action.

B-1.4 Each sample container shall be sealed air-tight after filling and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

B-2. SCALE OF SAMPLING

B-2.1 Lot — All the containers in a single consignment of the material of one grade and drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different grades or batches of manufacture, the containers belonging to the same grade and batch shall be grouped together and each such group shall constitute a separate lot.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of the specification.

B-2.2 The number (n) of containers to be chosen from a lot shall depend on the size of the lot (N) and shall be in accordance with col 1 and 2 of Table 2.

TABLE 2 NUMBER OF CONTAINERS TO BE SELECTED

(*Clause* B-2.2)

LOT SIZE *N* (1)	NUMBER OF ??? TO BE SELECTED *n* (2)
Up to 50	3
51 „ 200	4
201 „ 400	5
401 „ 650	6
651 „ 1 000	7

B-2.3 The containers shall be chosen at random from the lot and in order to ensure randomness of selection, a random number table shall be used. In case such tables are not available, the following procedure may be adopted:

> Arrange all the containers in the lot in a systematic manner and starting from any container, count them 1, 2, 3,… , up to *r* and so on, where *r* is the integral part of *N/n*. Every *r*th container thus counted shall be taken out for drawing samples.

NOTE — For details of this procedure as well as other methods of random selection, reference may be made to IS : 4905-1968*.

B-3. TEST SAMPLES AND REFEREE SAMPLE

B-3.1 Preparation of Test Samples

B-3.1.1 Draw with an appropriate sampling instrument a small portion of the material from different parts of each container selected. The total quantity of the material drawn from each container shall be sufficient to make triplicate determination for all the characteristics given under 3 and shall not exceed 1 kg.

B-3.1.2 Thoroughly mix all portions of the material drawn from the same container. Out of these portions a small but equal quantity shall be taken from each selected container and shall be well mixed up together so as to form a composite sample weighing not less than 600 g. This composite sample shall be divided into three equal parts, one for the purchaser, another for the supplier and the third to be used as referee sample.

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*Methods for random sampling.

B-3.1.3 The remaining portion of the material from each container (after a small quantity needed for the formation of composite sample has been taken) shall be divided into three equal parts, each part weighing not less than 100 g. These parts shall be immediately transferred to thoroughly dried bottles which are then sealed air-tight with stoppers and labelled with all the particulars of sampling given under **B-1.4.** The material in each such sealed bottle shall constitute an individual test sample. These individual samples shall be separated into three identical sets of samples in such a way that each set has an individual test sample representing each container selected. One of these three sets shall be sent to the purchaser, another to the supplier and the third shall be used as referee sample.

B-3.2 Referee Sample — The referee sample shall consist of the composite sample (*see* **B-3.1.2**) and a set of individual samples (*see* **B-3.1.3**) marked for this purpose and shall bear the seals of the purchaser and the supplier. These shall be kept at a place agreed to between the purchaser and the supplier and shall be used in case of dispute between the two.

B-4. NUMBER OF TESTS

B-4.1 Tests for the determination of magnesium sulphate shall be conducted on each of the individual samples for both the grades.

B-4.2 Tests for the remaining characteristics shall be conducted on the the composite sample.

B-5. CRITERIA FOR CONFORMITY

B-5.1 For Individual Samples

B-5.1.1 *For Magnesium Sulphate* — The test results for magnesium sulphate shall be recorded, and the mean and the range for these test results shall be calculated as follows:

Mean $\bar{x}$ = Sum of the test results divided by the number of test results, and

Range (R) = The difference between the maximum and the minimum values of the test results.

The value of expression ($\bar{x} \pm 0.6 R$) shall be calculated. If the values of this expression lie within the limits specified for the relevant grade in Table 1, the lot shall be declared to have satisfied the requirements for this characteristic.

B-5.2 For Composite Sample — The lot shall be deemed to have satisfied the remaining requirements (*see* **B-4.2**) if all the test results on the composite sample shall meet the corresponding requirements specified in Table 1 for the relevant grade.

B-5.3 The lot shall be declared as conforming to the requirements of the specification if **B-5.1** and **B-5.2** are satisfied.

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 331 01 31
331 13 75

Telegrams : Manaksanstha
(Common to all Offices)

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5-8-56C L. N. Gupta Marg, (Nampally Station Road) HYDERABAD 500001	23 10 83
R14 Yudhister Marg, C Scheme, JAIPUR 302005	6 34 71
117/418 B Sarvodaya Nagar, KANPUR 208005	21 68 76
Plot No. A-9, House No. 561/63, Sindhu Nagar, Kanpur Road, LUCKNOW 226005	5 55 07
Patliputra Industrial Estate, PATNA 800013	6 23 05
District Industries Centre Complex, Bagh-e-Ali Maidan, SRINAGAR 190011	–
T.C. No. 14/1421, University P. O., Patayam, THIRUVANANTHAPURAM 695034	6 21 04

Inspection Offices (With Sale Point) :

Pushpanjali, First Floor, 205-A West High Court Road, Shankar Nagar Square, NAGPUR 440010	52 51 71
Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 411005	6 24 35

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*Sales Office Calcutta is at 5 Chowringhee Approach, P. O. Princep Street, CALCUTTA	27 68 00
†Sales Office is at Novelty Chambers, Grant Road, BOMBAY	89 65 28
‡Sales Office is at Unity Building, Narasimharaja Square, BANGALORE	22 39 71

Reprography Unit, BIS, New Delhi, India